

## **CURRENT STATUS OF THE STATEWIDE WHEAT BREEDING PROGRAM**

Mike Barnum, Randy Dovel, Erling Jacobsen, Steve James, Russ Karow, Randy Knight, Warren Kronstad, Mike Moore, Richard Roseburg, Mary Verhoeven and Pam Zwer

The two-fold purpose of the wheat breeding program is to provide the grower with wheat varieties that are cost-efficient to produce and to furnish to the industry cultivars with superior quality for various end product uses.

To address the first purpose of the program, varieties must be disease and insect resistant, adaptable to various tillage practices, and withstand abiotic stresses such as pH tolerances and moisture stress. All of the above should be packaged in a cultivar with good yield potential.

The second aspect of the program deals with the ultimate use of the crop. Here quality is of paramount importance, and desirable characteristics differ with different market classes of wheat. The biochemical components of the wheat kernel are influenced by both genetics and the environment, nature, and nurture. The task of the plant breeder is to put the desired genes for quality into the cultivar and the grower to provide the proper environment for the expression of those genes. Of course, mother nature may or may not cooperate with these plans.

To offer the producer management options, the wheat breeding program works on developing cultivars

of soft white winter wheat, hard white winter wheat, winter durums, club wheat, and spring wheat. The major effort is on soft white winter wheat development.

**Soft White Winter.** Several advanced lines are being considered for release. OR908361 and OR908369 carry the VPM/MOS 951 gene for strawbreaker footrot resistance. These lines have excellent flour yield and are on increase for breeder seed this year. OR880494 and OR880510 also have excellent quality and are resistant to the current biotypes of common and dwarf bunt. They have lower yield potential than Stephens or Madsen, but on lower yielding sites they are competitive. Both lines have been submitted for collaborative testing. Lines for collaborative testing are sent to four or five millers and end product manufacturers where that market class of wheat is commonly used. This is normally outside the United States. Four cultivars are currently being tested in the regional nursery. OR870012, OR880172, OR880525 and OR870337 have quality attributes that equal or surpass the current commercial cultivars in at least three areas. OR880172 has been submitted for collaborative testing.

**Hard White Winter.** Two promising hard white winter selections, OR850513 and OR889176 are being considered as potential varieties. OR889176 has been submitted for collaborative testing. This line has very good milling scores and loaf volume has been equal to or better than the hard red varieties of Hoff and Wanser. Although the hard white wheats are designed for noodle or flat bread end products, good

bread baking capability is desirable. They could then be used as blend in the domestic market. OR850513 is not as exceptional in flour yield and loaf volume, but it has outstanding starch pasting viscosity, which is very important to the noodle market.

Perhaps it would be good to digress and explain what is known about the attributes desirable for noodles. There are three major characteristics needed to make a good noodle: color, starch pasting viscosity, and protein. First, most of the Oriental noodles are fresh, and no one likes a gray or green noodle. Many flours, when made into noodles, discolor over a period of 24 to 48 hours. There is genetic variation for this character, and three tests are being employed by the OSU Quality Lab, the Wheat Quality Lab in Pullman, and the Wheat Marketing Research Center Lab in Portland to identify lines with acceptable color.

Second, all three labs are using various instruments to test for starch quality. Starch quality imparts a good “mouth feel” to the noodle. If the quality is not there, the noodles are mushy.

Finally, enough protein must be present to hold the noodle together. At the OSU Quality Laboratory, the early generation material is screened for the aforementioned parameters. Once lines have been entered into yield trials, the material is sent to the Wheat Quality Lab in Pullman for more extensive evaluation. The most advanced material is often tested by the lab in Portland as well, where actual noodles can be made on a pilot scale.

Four other hard white selections besides OR850513 and OR889176 are in regional testing this year.

Approximately 550 hard white lines were received from CIMMYT/ICARDA’s Turkey program last year. After a pre-screening at OSU, many of these lines have been sent to Pullman for evaluation. The pedigrees of this material contain lines from the Oregon program, Kansas, Colorado, Nebraska, and from many Eastern European breeding programs.

**Spring Wheat.** Three hard white spring lines, OR4870255, OR4870279, and OR4870374 have been entered in the collaborative testing program. These lines, when compared with Klasic, are not as good in loaf volume. OR4870255 and OR4870374 are better millers than Klasic, and the former has better color and RVA score, which is a measure of starch pasting viscosity. OR4870279 had the highest RVA score in the nursery.

Four hard red spring selections are in advanced testing. OR4870410, OR4870401, OR4870400, and OR4880189, when compared to McKay, are equal to or superior in milling and baking quality. All of these lines, with the exception of OR480401 have been in regional testing. OR480401 is in the regional nursery this year.

**Durums.** Work on winter and spring habit durums is in progress. On the winter side, crosses have been made and winter durum lines developed in Oregon are being tested in the advanced and preliminary nurseries. Winter

hardiness and quality are the primary goals of this aspect of the program.

The spring durums in the program represent a selection of lines primarily from the CIMMYT program in Mexico. They are surprisingly well adapted to the growing conditions around Pendleton and often out-yield the bread wheats. Testing for durum quality is difficult. The lab at OSU is equipped to analyze seed color for the durums for the desirable deep yellow, but milling to make semolina is beyond its capabilities. Selections are often sent to the USDA/ARS lab in North Dakota for quality analysis. Pendleton Flour Mills also looks at the samples.

**Club Wheat.** With the requirement for a higher percentage of club wheat in Western Soft White shipments and talk of some markets taking shipments of 100 percent club wheat, the future for club wheat looks bright. This favorable outlook comes at a time of transition for the Club Wheat Breeding Program as the direction of the activities shifts from Dr. Pamela Zwer to Dr. Warren Kronstad. Mike Moore, a senior research assistant with Dr. Kronstad's program, was transferred to the Columbia Basin Agricultural Research Center on September 1, 1994 in an effort to facilitate the transfer of materials and information. The smooth transition for continuing the efforts of the Club Breeding Program, both in breeding efforts and satisfying grant obligations, has been made possible by the professional and cooperative attitude of Pamela Zwer, and the efforts and support of Vicky Correa and Teresa Walenta as well as staff at the Columbia Basin Agricultural Research Center. The

overall goal of the program is still to produce club wheat varieties with quality characteristics to meet market requirements and agronomic characteristics to make them profitable for Pacific Northwest wheat producers.

The Club Wheat Breeding Program has ongoing efforts in the following areas:

- Russian wheat aphid screening of program material for resistance.
- Stripe rust inoculation of early generation material in the field at the Columbia Basin Agricultural Research Center.
- Club wheat hybrid production.
- Evaluation of early generation and advanced lines for quality, disease reaction, agronomic characteristics, and yield potential.
- Purification of lines identified as potential releases.
- Cooperation in the Statewide Cereal Testing Program.

Russian wheat aphid (RWA) resistance screening of breeding program material will follow procedures developed by Dr. Zwer using seedlings to predict adult plant responses to RWA. Aphid populations maintained by Vicky Correa will be used. Lines from the elite and advanced nurseries will be assessed for RWA reactions. Lines with RWA resistance will continue to see use as parental material in the crossing program.

Stripe rust inoculation consisted of the use of spores from liquid nitrogen storage mixed with talc, which were dispersed through the F2 materials during weather conditions that favored infection. Plants infected with Tres type

stripe rust were also transplanted at intervals in the same fields. Selections will be made at harvest with stripe rust resistance as one of the selection criteria.

Club wheat hybrid production in the greenhouse at the Columbia Basin Agricultural Research Center will utilize about 230 lines planted at two dates approximately one month apart. Some of these lines are currently in the program as potential new varieties, while others are sources of RWA, footrot or stripe rust resistance. Dr. Kronstad will also be making crosses with parental lines as well as F1 materials planted at Corvallis. Crossing priorities are quality, yield, disease resistance, and emergence.

Agronomic notes are of major importance as lines are assessed for their ability to contribute as a new variety or as breeding material in future crosses. Notes on heading date, reaction to numerous diseases, lodging, shattering, and any other items of interest will be taken throughout the growing season.

Dr. Zwer currently has three lines identified as potential new releases. These lines are in the Statewide Cereal Testing Program for the first time this year. These lines have purification blocks planted in an effort to shorten the time between the decision to release and the actual availability of seed to the producer.

The Club Wheat Breeding Program has five sites that it plants, maintains, and harvests in a cooperative effort with Russ Karow and Statewide Cereal Testing Program. Trials are planted at the Columbia Basin Agricultural Research Center, the Sherman County Experiment Station, with Charlie Anderson above Heppner, the Hermiston Agricultural Research and Experiment Center, and with John Cuthbert outside of Island City.

Early generation material is located at the Columbia Basin Agricultural Research Center in a headrow format, with selections to be made this fall by Dr. Kronstad. Notes will be taken throughout the season to assist in the selection of materials. Club yield trials are planted at the Columbia Basin Agricultural Research Center and the Sherman County Experiment Station.

The efforts of the Club Wheat Breeding Program will continue in a manner that assures none of the recent advances are lost and that the program continues to work toward the production and release of new club wheat lines that have the quality characteristics that the market desires and the yield potential to make them profitable for the producers of the Pacific Northwest.